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AN ENUMERATION OF THE SPECIES OF
PARAMIGNYA, ATALANTIA AND
CITRUS, FOUND IN MALAYA.

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At the present time botanists are unable to agree upon a scheme of classification for the genera of the Aurantieae or Citratae on account of insufficient information regarding most of the species; and very divergent views have been put forward. Swingle, for instance wishes to insert between the genera long recognised, "microgenera" with a narrowness which offends my conception of what a genus is: Guillaumin, on the other hand, has proposed the union of *Paramignya* and *Atalantia*. I propose here to add a little information to the common stock; to accept certain of Swingle's genera as subgenera; and to define afresh *Paramignya* and *Atalantia*. by the aid of their fruits. The type-species of *Atalantia* is *A. spinosa*, Koorders, though the generic name dates from a paper published by Correa in 1805. The type-species of *Paramignya* is *P. monophylla*, Wight, in 1838.

At first, that is to say by Wight, *Paramignya* was distinguished from *Atalantia* by the position of the two ovules,—one higher than the other in the first case, both at a level in the second,—and by the disunion of the filaments in the first and their union in the second.

When with the addition of further species to each genus, these characters seemed to break down, botanists put forward as an alternative the condition of the disc,—a simple gynophore in the first, a ring or cup in the second, and added that the anthers in the first show a somewhat greater elongation than in the second.

Then Guillaumin (in Lecompte, Not. Syst., 1, 1910, p. 175) pointed out that when a sufficient series of species is reviewed, the gradation from the one condition to the other makes it impossible to draw a line between the two genera. He characterised his combined genus *Atalantia* by, *inter alia*, the possession of fruits containing pulp-cells such as the oranges have. But had his material been more ample, he would have found no pulp-cells in several of his species including that upon which Wight founded the genus *Paramignya*; and he might have observed in the Malayan species which are without pulp-cells, bulkier seeds than in the others.

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I propose to keep the name *Paramignya* for the species which are without pulp-cells, and *Atalantia* for those with pulp-cells. *Atalantia* thus lies next to *Citrus*; and *Paramignya* shares with some other genera more remote from *Citrus*, the character of pouring into its loculi from glands in the walls a small amount of a volatile oil.

Pulp-cells probably originated as water-storage tissue for the use of the growing ovules. A second stage in their evolution was entered on at once, for, *pari passu*, they commenced to store food-substances also. Man then selected the *Citrus* fruits with most stored substance, especially sugars. In this way the best of the newer species were created as cultigens which are placed towards and at the end of the enumeration which I give.

The pulp-cells of some of the species contain volatile oil. Its origin and function there need study, in which it must be remembered that the aromatic oils undergo change in *Citrus* fruits during ripening. Botanists who are able to examine the fruits of *Paramignya* and *Atalantia* in life should seize any opportunity of studying them.

A. STAMENS 6—10: ovules 1 or 2 in each loculus.

B. PULP-CELLS absent, a sticky secretion taking their place.....PARAMIGNYA.

The smallest flowered of the series is a species which bears the name *Atalantia trimera*, Oliv. It has three sepals and three petals; six stamens and fruit characteristic of *Paramignya*. It should bear the name *P. trimera*.

Atalantia missionis, Oliv., which should be known as *P. missionis*, is tetramerous. Swingle has made a genus, *Pamburus*, for it (Journ. Wash. Acad. Sci. 6, 1916, p. 336). To be pentamerous is the most usual condition.

1. *Paramignya cuspidata*, Burkill; *Atalantia cuspidata*, Ridley in Journ. Roy. As. Soc. Straits Branch, 82, 1920, p. 174, and Flor. Mal. Penins. 1, 1922, p. 357. This is a sprawling shrub known only from the west coast of the Malay Peninsula where it has been found in the Dindings (with flowers in February, Ridley 8391. and with fruit in March, Ridley 7944!) and near Malacca (Sungai Udang, with fruit in November, Ridley and Goodenough 1607!). Upon the last-quoted sheet it is called "limau pagar" or hedge-lime. The stamens are free and the ovary is carried on a columnar gynophore. The large seeds are surrounded by a sticky substance, which in the dried specimens smells like varnish.

2. *Paramignya* sp. An undescribed species found in the island of Penang (near the waterfall, with fruit in January, *Curtis* 2207!, and on Penang Hill, just after the fall of the flowers, in December, *Ridley* 7042!). It has subellipsoid fruits bluntly pointed at either end, a single seed at maturity, and a substance in the loculus smelling in the dried state like wood-tar. The possibility of it being *Amyris simplicifolia*, Roxb. is to be remembered.

Paramignya scandens, Craib: *Citrus scandens*, Griff.: *Paramignya griffithii*, Hook. fil., *Flora Brit. Ind.* 1, 1872, p. 510, excluding the Malacca specimen. This species was found by Griffith in Burma at the Serpentine Mines and described by him. It is now known to occur from the Eastern Himalaya and southern China into Siam and the Philippine islands: but it does not reach British Malaya.

The specimens quoted in the *Gardens Bulletin* 6, 1930, p. 181, among Malayan medicinal plants from Grik and Kuala Kangsar in Perak, and from Manchis in Pahang, seem to belong to this species.

3. *Paramignya ridleyi*, Burkill: *P. griffithii*, Hook. fil. in loc. cit., only as regards the Malacca specimen: *Ridley*, *Flora Mal. Penins.* 1, 1922, p. 356. This species has much longer pedicels than *P. scandens* and is abundantly distinct. It was collected in Malacca by Griffith, and by Hullett in Singapore. The backs of the leaves are less hairy than those of *P. scandens*.

4. *Paramignya lobata*, Burkill: *Atalantia hispida*, *Ridley*, *Flora Mal. Penins.* 1, 1922, p. 357, not of *Pierre* ex. *Guillaumin*: *A. monophylla*, *Ridley* in *Journ. Roy. As. Soc. Straits Branch*, 26, 1894, p. 26, not of DC. This curious plant with lobed fruits, has been collected twice, on both occasions near river-mouths. On the first occasion it was obtained in Johore (near Batu Pahat with fruits in November, *Lake and Kelsall*!) and upon the second in Kelantan (on the coast at Tumpat, near Kota Bahru, in fruit in February, *Ridley*!). Moreover a sterile twig collected in Negri Sembilan (no precise locality, *Alvins*!) may be it. The fruit is described as red. It has relatively large seeds, and the thin fruit-wall is extended by each seed which matures, into a lobe, up to the number of five.

5. *Paramignya angulata*, Burkill: *Citrus angulata*, Willd.: *Gonocitrus angulata*, Kurz: *Merope angulata*, Swingle in *Journ. Wash. Acad. Sci.* 5, 1915, p. 423; *Paramignya longispina*, Hook. fil.: *Ridley*, *Flora Mal. Penins.* 1, 1922, p. 356. This seems to be a coastal bush: at any rate it was found by Rumpf upon the coast of

Amboyna and has been found near the coast of Java, and in Singapore island seems to occur close behind the mangroves. Kurz mentions it in a paper upon Burmese plants, but does not say precisely that he had obtained it in Burma. It has very long thorns. The Singapore localities are:—Kěranji, with fruit in February, Goodenough! Sungai Jurong, with fruit and flowers, but undated, *Ridley* 8062 !, and Kim Seng road upon the edge of Singapore town, with fruit, but also undated, *Ridley*! As a Malay name “limau lelang” is recorded, given doubtless in reference to a hawk’s talons, the long spines being likened to them.

BB. *PULP-CELLS in the loculi: seeds smaller*.....

ATALANTIA.

6. *Atalantia spinosa*, Koorders: *Sclerostylis spinosa*, Blume: *Atalantia monophylla*, DC.: *Ridley*, Flora Mal. Penins. 1, 1922, p. 356. This is a very widespread bush of India, which passes southwards through Burma and Siam, and into Malaysia in a permissive way, not being able to exist except in peculiarly favourable localities. It enters British Malaya at the north and passes southwards along the coasts to Penang: then it is in Pulau Tioman, in St. Barbe island, Banka and in Java. The following specimens from Lower Siam and Malaya have been seen. **Siam.** Prachuap, in fruit in September, *Put* 246! 288! and 289! Bangson, in fruit in May, *Mohamed Haniff and Mohamed Nur* 4022! Champawn, in flower in January, *Kerr* 12881! Kaw Tao, in flower in April, *Kerr*! Kaw Samui, in flower in November, *Put* 1275! Islet near Pulau Panji, in flower in November, *Mohamed Haniff and Mohamed Nur* 4063! Pulau Mohia, in flower in February, *Hamid* 2955! Kaw Sun Tun, in flower in January, *Annandale*! Pulau Tengeh, in fruit in April, *Ridley*! Terutao, in fruit in August. *Curtis* 1671! Telok Apau in Terutao, in flower in November, *Mohamed Haniff and Mohamed Nur* 7497! **Perlis**, at Chupeng, in fruit in March, *Ridley* 15039! **Kedah**, Langkawi islands, in fruit in June, *Curtis*! Pulau Song-song, in fruit in June, *Ridley*! and in fruit in May, *Mohamed Haniff* 12585! **Penang**, without precise locality, *Cantley’s collector* 2562! Telok Bahang, Saleh! Pulau Butong, on the west of Penang island, *Curtis* 467! **Pahang**. On Pulau Tioman at Tanjong Layer, in fruit in May, *Henderson*! and at Telok Paya, also in fruit in May, *Henderson* 18409!

There is confused history in the nomenclature of this species. The adjective “monophylla” was used by Linnaeus in 1771 (*Mantissa*, p. 237) for an allied plant of Ceylon as *Limonia monophylla*: and in 1795 Roxburgh

figured our plant from the eastern side of India (Coromandel plants, p. 60 and plate 83) thinking it to be the same. Correa in 1806 (Ann. Mus. Hist. Nat. Paris, 6, p. 383) created the genus *Atalantia*, for Roxburgh's plant, but did not actually make the combination *A. monophylla*: this was reserved for DeCandolle in 1824 (Prodromus 1, p. 536). But obviously the Ceylon plant has a right to the name against our plant, and another must be substituted.

In 1825 Blume (Bijdragen tot de Flora van Ned.-Indie, 1, p. 134) described our plant as *Sclerostylis spinosa*. Much later Sir Joseph Hooker reduced *Sclerostylis* to *Atalantia* but did not make the combination *A. spinosa*: this was done by Koorders (Excursionfl. v. Java, 1912, 2, p. 427), who ascribed it to Hooker. However there is a possibility that the use of the adjective "spinosa" should be traced yet further back than Blume's paper in 1825, namely to Willdenow's *Species Plantarum* in 1800, where *Trichilia spinosa* is founded upon a specimen which I have not seen, with a reference to that part of Hellenius' *Turraea virens* which is his figure 1 and not his figure 2 (Kongl. Vetensk. Acad. Handl. Stockholm, 1788, plate 10).

7. *Atalantia kwangtungensis*, Merrill: *A. ?roxburghiana*, Hooker fil., Flora Brit. Ind. 1, 1872, p. 513: *A. roxburghiana*, Ridley, Flora Mal. Penins. 1, 1922, p. 357: Tanaka in Journ. Bot. 1930, p. 232, under *A. simplicifolia*.

A sprawling bush, very similar to the last, but a little larger; and in the Malay Peninsula, upon its southern border, as well as in Sumatra; moreover, Tanaka says that it occurs northwards in Annam and southern China. If Tanaka is right in identifying it with *A. kwangtungensis*, Merrill (the writer has been unable to verify this, but accepts his statement), it is by this name that it must be called; for the binomial *A. roxburghiana* which he uses unquestionably belongs to *A. simplicifolia*.

The localities in Malaya are:—Kedah, on Bukit Lanjut near Gunong Bintang, with young fruit in April, *Mohamed Haniff* 21029! Perak, in Upper Perak without precise locality, in fruit in July, *Wray* 3743! Gopeng District, on the top of limestone hills, with fruit in July, August and September, *Kunstler* 4557! 4724! and 8192! Malacca, *Griffith* 537!

8. *Atalantia simplicifolia*, Tanaka in Journ. Bot. 1930, p. 232: *Amyris simplicifolia*, Roxburgh, Flora Indica 2, 1832, p. 244: *Sclerostylis roxburghii*, Wight, Icones 1, 1838, plate 72: *Atalantia roxburghii*, Oliver in Journ. Linn. Soc. Lond. Bot. 5, second suppl., 1861, p. 25: *A.*

roxburghiana, Hooker fil., Flora Brit. Ind. 1. 1872, p. 513, excluding Griffith's plant which, however, was added with a query: *A. caudata*, Hooker fil., in the same place.

Roxburgh's species is recorded as a plant cultivated in the Honourable East India Company's Botanic Garden, near Calcutta, which had been obtained from Penang. A drawing of it exists at Kew, and a botanical specimen in the British Museum of Natural History. The drawing fails to represent the specimen exactly, chiefly in its broader leaves. The description might fit either, and is very brief. A closely corresponding specimen is preserved at Kew, labelled "*Sclerostylis* ?, Bengal" to which is added as a correction "*Hort. Bot. Calc.*"

Wight published Roxburgh's drawing; and his name was not applied to anything but the drawing. Oliver recognised the specimen in the British Museum and possibly also that at Kew as identical with specimens which Hooker had collected at Cherra Punji in the Khasia Hills, and called both *Atalantia roxburghii*. Hooker, eleven years later, swayed by the drawing, dissented from Oliver's conclusion, called the Khasia Hills plant, *Atalantia caudata*, and with some doubt united to Roxburgh's species a specimen collected by Griffith in Malacca. He based his description upon the drawing, adding the shape of the fruit from Griffith's plant, declaring the source.

It is necessary to retreat from Hooker's position to Oliver's, but to adopt Roxburgh's specific name, as Tanaka has done.

Unfortunately the species has not been found again in Penang: nor are fruiting specimens available from any locality, so that it is possible for it to prove a *Paramignya*, but the gynophore is cupular.

The only Malayan locality is Penang, and this on Roxburgh's authority.

AA. STAMENS 10, free; the ovules numerous, (compound leaves).....CITRUS § PSEUDAEGLE.

In this place comes the curious bush, *Citrus trifoliata*, Linn. Some botanists have inserted it into the genus *Aegle*: the genus *Pseudaegle* was made for it; and Swingle has resuscitated Rafinesque's genus *Poncirus* for it (in Bailey's Stand. Cyclop. Hort., 1916, p. 2751). It is placed in a section, *Pseudaegle*, of *Citrus*, in Engler's *Pflanzenfamilien*.

It grows in more temperate climates than most species of *Citrus*, and can serve as a stock upon which they may be grafted. Moreover it hybridises with them.

9. *Citrus malaccensis*, Ridley, Flora Mal. Penins. 1, 1922, p. 359. The characters of this extremely interesting plant have not been brought into adequate prominence. It was collected in the year 1893 twice in the interior of the Territory of Malacca, and is represented in the herbarium of the Botanic Gardens, Singapore, by a sheet of each gathering. Derry obtained it with flowers in January, and Goodenough with fruit in July. Derry's locality is given as Bukit Sedanan; Goodenough's as Nyalas: these places are 6—8 miles apart. Upon the two sheets there are ten leaves; and upon each sheet one is compounded by having a single lateral leaflet. Other leaves have a scar at the apex of the narrowly winged petiole and therefore count as compound: others have no scar, and obviously are simple. Trifoliate leaves do not exist; but it would be curious if they are never produced. There is a conspicuous joint between the petiole and the leaf-blade or blades. The flower suggests that of *Merrillia caloxylon*, Swingle. The sepals are in shape as those of *Atalantia* and have large glands. The petals are nearly spatulate, and with glands in the broadened upper part. The stamens apparently are 10, free, with long filaments and rather short anthers. The ovary is hairy and fluted with five grooves: it is hard to distinguish the exact place where the gynophore passes into it. The style is as long as the ovary and ends in a large stigma. There are numerous ovules. For other points the original description may be consulted.

AAA. STAMENS 16—60: the fruit relatively large with 2—many ovules in each loculus: the disc a circular bolster.

C. STAMENS 12—20: the ovules not more than 2 in each loculus.

D. STAMENS free

CITRUS § EREMOCITRUS.

Here comes a very interesting Australian species *Atalantia glauca*, Benth., which is one of the bridges between *Atalantia* and *Citrus*, for which reason Swingle puts it into neither, but makes a genus for it,—*Eremocitrus* (Journ. Agric. Res. 2, 1914, p. 86). It is made into a preserve in Australia.

DD. STAMENS polyadelphous

CITRUS § FORTUNELLA.

Here come the Kumquats of Japan and China, which Swingle quite consistently treats, as he treated *Atalantia glauca*, making for them a new genus,—*Fortunella* (Journ. Wash. Acad. Sci. 5, 1915, p. 165). He enumerates six points against including them in *Citrus*, meaning thereby Eu-citrus, (1) that the ovary

is only 3—5-celled or rarely 6—7-celled, whereas that of *Eu-citrus* is 8—15-celled; (2) that they have only two collateral ovules in each loculus, against 4—12; (3) that in the cavernous stigma they have a few oil-glands; (4) that the underside of the leaf is pale and nearly veinless, with numerous deep glandular dots; (5) that the rind is edible and sweet; and (6) that the flower buds are more or less angular and small. He continues his definition by remarking that they differ from *Atalantia* in having twice as many stamens and in being in general agreement with *Citrus* in twigs, leaves, spines, flowers and fruit-characters.

The addition to *Fortunella* of the following species will be found to weaken his already too weak generic characters.

10. **Citrus polyandra**, Burkill: *Atalantia polyandra*, Ridley, Flora Mal. Penins. 5, 1925, p. 295: *Fortunella swinglei*, Tanaka MS. in Herb. Kew. This bush is a frequent plant in garden fences and in the neighbourhood of houses in the Territory of Malacca, and evidently occurs elsewhere in the Malay Peninsula. It produces globose fruits, with a small amount of pulp in them and no gummy secretion. They are five-celled, and with two ovules in each cell (it is not possible however to prove that this is the limit). The core may be hollow. The skin is thin, and not strongly aromatic. The whole serves as an acid flavouring under the name "limau pagar" or hedge lime.

The following specimens have been seen; six of them were inadvertently listed as specimens of *Atalantia roxburghiana* in the first volume of the Flora.

Perak. Lubok Merbau near Kuala Kangsar, in flower and with fruit in October, *Mohamed Haniff*! Negri Sembilan. Seremban, in fruit in December, *Ridley* 10052! Tampin, at the foot of the hill, in young fruit in May, *Goodenough* 1922! **Malacca.** Alor Gajah, in flower and fruit in October, *Burkill and Mohamed Haniff* 16375! Tebong, *Derry* 905! Selandar, in flower in January, *Derry* 1105! Ayer Panas, in fruit in November, *Goodenough* 1678! Malacca town towards Pringgit, in fruit in January, *Griffith* 540! near Malacca, *Ridley*! and in flower and fruit in May and June, *Maingay* 1099! and 1099A!

11. A plant with similar leaf-blades but shorter petioles (*Dindings*, *Ridley*!).

CC. STAMENS 16—20 and sometimes to 30, the ovules many in each cell.....

CITRUS § MICROCITRUS.

Here come the Australian species of *Citrus* for which Swingle has proposed the genus *Microcitrus* (Journ. Wash. Acad. Sci. 5, 1915, p. 570). They have acid

fruits, either globose or elongated, and so much so that one bears the name of "Finger Lime."

CCC. *STAMENS* 20—60.

E. *STAMENS* free.....*CITRUS* § *PAPEDA*.

12. *Citrus hystrix*, DC. This is the "limau pěrut" of the Malays, the "jeruk pěrut" of the Sundanese. It is grown throughout Malaysia, and is quite common in Malaya in cultivation, and the fruits on sale as a material with which to wash the hair and also the body. The fruit of the commonest race is rather papillose. It is said that the pulp-cells carry a little oil in them. The very big wings upon the petioles characterise it and the next species.

EE. *STAMENS* polyadelphous.....
CITRUS § *EU-CITRUS*.

F. *PETIOLE* with a very large wing.

13. *Citrus macroptera*, Montrouz: *Citrus hystrix*, Ridley, Flora Mal. Penins. 1, 1922, p. 358, not of DC. This species occurs from north-eastern India and south central China to New Caledonia, in several varieties. The type was described from the last-named island (Mem. Acad. Lyon, 10, 1860, p. 187). The China plant has received the names *Citrus cavaleriei*, Leveille, and *Citrus ichangensis*, Swingle. The Indian tree appears to deserve varietal rank. The foliage, as already remarked, is like that of *Citrus hystrix*, but the big very thick-skinned globose fruits are entirely different. The pulp-cells contain a secretion which in dried specimens may cause them to glisten. Because it is a wild tree, one Malay name for it is "limau hantu," ghost's or wild lime. A fruit brought to an Agricultural show in Seremban was called "limau abang" probably meaning red lime. Specimens have been seen from:—

Kelantan, Sungai Ketil, near Gua Musang, with fruit in August, *Henderson*! Perak, Kuala Dipang, with fruit in September, *Ridley* 9635! Pahang, without locality, but doubtless in northern Pahang, *Machado*! Kemasul forest reserve, with fruit in September, *Hamid* 10635! base of Gunong Senyum, with fruit in July, *Henderson* 22279! Malacca, Bukit Kedondong, sterile and a little doubtful, *Derry* 643!

An interesting figure of it is given in Fairchild's new book, *Exploring for plants*, (1930, p. 365), shewing the production of the large fruits to be in bunches. The photograph was taken in Sumatra.

FF. *PETIOLES* always much smaller than the leaf-blade, and sometimes scarcely winged.

G. *JOINT between the petiole and the leaf-blade not distinguishable.*

14. *Citrus medica*, Linn.: Ridley, Flora Mal. Penins. 1, 1922, p. 358, var. "limau susu" only. The race of *Citrus medica* most familiar to Europeans is the Citron. It reached the Mediterranean from Asia before the lemon and the orange. It had travelled westward as far as Persia before the invasion of that country by Alexander the Great, and Theophrastus knew of it: it became acclimatised in Italy at the commencement of the Christian era, and soon spread rapidly in Europe. Doubtless it had obtained a considerable distribution in Asia before it reached Persia. It exists in the Malay Peninsula in several races, and sometimes wild, when like other wild states of *Citrus*, the Malays call it "limau hantu," ghost's or wild lime. To them the most familiar race is "limau susu" or nipple lime, so called from the shape of the fruit. "Limau mata kərbau" or buffalo's eye lime is another name for this or a similar race. "Limau kərbau," buffalo's or big lime, seems to indicate a different race. "Limau pagar," hedge lime, and "limau kédangsa," have been recorded for it, but also for another species.

Apparently the Javanese have better races than the Malays: and one called "jėruk katis" is used by them for candying.

Citrus medica, var. *sarcodactylis*, Swingle: Buddha's fingers: "limau jari," is a fixed abnormality, in which the carpels are separated. There is more than one race of it. The rind is very fragrant and the fruit of great repute among the Chinese for medical use, both in their own country and in the Malay Peninsula. Swingle thinks it originated in India, and was taken to China by Buddhist monks, because of its name, and because Bretschneider has failed to find mention of it in the chinese classics (Sargent, Plant. Wilson., 2, 1916, p. 142).

GG. *JOINT between the petiole and the leaf-blade easily distinguished.*

H. *SKIN of the fruit tight,—as a class "limau potong" among the Malays.*

15. *Citrus limon*, Burm., the Mediterranean Lemon. This native of India found its way westwards to Egypt in the third century and soon afterwards reached Sicily. Its flower buds are tinted with red as those of *C. medica*; and in this it differs from the species 17—24: its leaves are crenate, and the petiole is merely margined. It has been experimented with in Malaya, and has fruited; but there is no place for it in the markets against the true lime.

16. *Citrus limonia*, Osbeck, the Canton Lemon. This gives a globose yellow-skinned sour fruit, which is known in Canton as "li-mung" and "li-mu." Tanaka (Bull. Sci. Fak. Terkult. Kjusu Imp. Univ., 1, 1925, p. 125), pointing out how obviously malayan in origin these names are, suggests that the species came from India via Malaysia about 700—900 years ago; and adds that races persist in Malaysia.

17. *Citrus retusa*, Hort. apud Tanaka. A globose green orange, which, in common with others, may be called "limau hijau," and is also "limau asam," "limau masam," and "limau sambal." The petiole is very narrowly winged.

18. *Citrus microcarpa*, Bunge: *C. medica*, var. *limau kasturi*, Ridley, Flora Mal. Penins., 1, 1922, p. 358. The well-known "limau kěsturi" or musk lime, is a race of this species. It has very small and very fragrant fruits which the Malays prefer to all others for making into sweetmeats. Also they salt it as a pickle.

There is a similar lime in the north of the Malay Peninsula, called "limau chuwit" or chancre lime, which appears to belong to this species.

19. *Citrus aurantifolia*, Swingle: *C. medica*, var. *limau nipis*, Ridley, Flora Mal. Penins., 1, 1922, p. 358. The true Lime. The common race of this species in Malayan gardens has globose fruits which turn a yellowish green when quite ripe; but an ellipsoid lime has been seen in Malacca. The lime of the West Indies is usually elongated.

20. *Citrus maxima*, Merr.: *C. decumana*, Linn.: *C. grandis*, Osbeck: *C. medica*, var. *limau kadangsa*, Ridley, Flora Mal. Penins., 1, 1922, p. 358. The pumelo and the shaddock; "limau Batawi" or Batavia lime, "limau Bali" or Bali lime, and "limau běsar" or big lime. Limau Bali is a race which was introduced by Sir Hugh Low. The Siamese seedless pumelo is a superior race in which the pollen is sterile; and when the trees of it are isolated seeds do not develop from failure to secure fertilisation. *C. maxima* is one of the most tropical of the genus, and is thoroughly at home in Malaya. Its fruits are produced singly, and are globose or nearly so, yellow or orange yellow, with a thick rind, and a great variability in the quality of the flesh (according to race): the pulp-cells contain mucilage rather than juice. The flower buds are white and the petioles have rather large wings.

21. *Citrus paradisi*, Macfad., the Grape-fruit. In appearance the fruit of this tree is very like a pumelo, but it is produced in clusters, is thinner skinned, and the pulp-cells contain juice instead of mucilage. It is now under experimental cultivation in the Peninsula.

22. *Citrus sinensis*, Osbeck, the Sweet Orange. This species reached the Mediterranean in the 16th century and gave rise there to the races—St. Michael or Blood, Joppa, Jaffa, etc., and in South America to the Washington Navel Orange. It is commonly called the Coolie Orange, down the China coast, from a name with this meaning. The Malays may call it “limau manis,” sweet orange, or “limau potong,” lime with a peel which requires to be cut off. But neither name is quite distinctive.

23. *Citrus aurantium*, Linn., the Seville Orange. This orange, the best for marmalade, reached the Mediterranean in the 9th or 10th century, and so before the arrival of the Sweet Oranges. It has been experimented with in the Malay Peninsula.

HH. *SKIN of the fruit loose,—as a class among the Malays*
“limau kapas.”

24. *Citrus mitis*, Blanco. A sour orange of the east of Asia, one race of which is the Calamondin of the Philippine islands. It has a thin yellow rind. The lower surface of the leaf recalls that of the Kumquats. “Limau nipis kapas” is a suitable descriptive name, recorded, but its application not noted satisfactorily.

25. *Citrus nobilis*, Lour., the Mandarin Orange (in contrast to the Coolie Orange), the Tangerine. This, being perhaps the most desirable of all the oranges, has often been experimentally planted in the Malay Peninsula, and is half-acclimatised in a race from China with characteristically cuneate lower halves to the leaves. The Nagpur Orange is another race of it which has been grown experimentally. The Satsuma Orange, which makes 7/10ths of the crops of Japan, is a variety. *C. nobilis* reached the Mediterranean only in the 18th century. Malay names for it are “limau japon” or japanese lime, and “limau wangkang,” the last name indicating a fruit of the navel type.

In conclusion the opportunity may be taken of correcting an error in regard to the malay plant-name ěmpĕnai. This name has been said to indicate an *Atalantia* (Journ. Roy. As. Soc. Straits branch, 30, 1897, p. 88) but an examination of the specimen from Perak which was collected under the name, shows that, whatever it is, it is not an *Atalantia*; nor is it allied closely.